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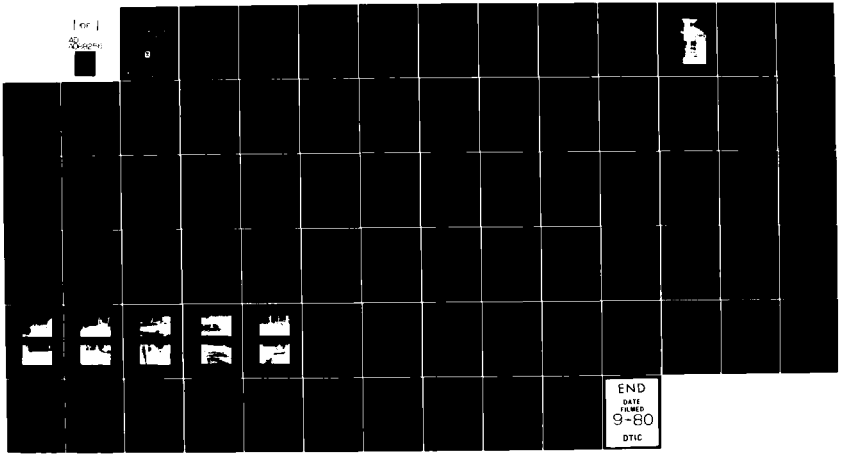

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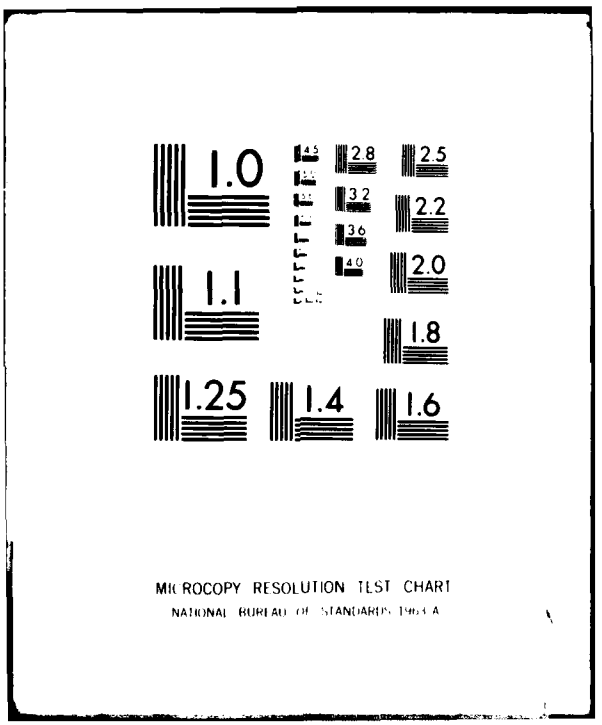
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RARITAN RIVER BASIN
SOUTH BRANCH OF RARITAN RIVER
HUNTERDON COUNTY
NEW JERSEY

CLINTON MILLS DIKE
NJ 00564

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY

Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

MARCH 1980

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(10) Richard J. McDermott

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Hunterdon County, New Jersey
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Clinton Mills Dike, New Jersey

20. ABSTRACT (Continue on reverse side if necessary and identify by block number):
This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE—2 D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-N

11 AUG 1980

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, New Jersey 08621

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Clinton Mills Dike in Hunterdon County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dike's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Clinton Mills Dike, a high hazard potential structure, is judged to be in fair overall condition. The spillway for the dike is located at Clinton Mills Dam (NJ00122) approximately 70 feet downstream from the dike. To ensure adequacy of the dike, the following actions, as a minimum, are recommended:

a. The following remedial measures should be initiated within six months from the date of approval of this report:

(1) Trees and brush should be removed from the embankment and the embankment surfaces should be suitably stabilized.

(2) A design for regrading of the embankment should be prepared by a professional engineer experienced in the design and construction of dams, and the embankment should be regraded accordingly.

b. The owners should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dike within one year from the date of approval of this report.

c. Arrangements should be made to form an agreement among the three apparent owners of the dike that would specify responsibilities for maintenance, record keeping and cost sharing for remedial work. The agreement should also specify any necessary easements for construction and maintenance. Remedial work should also be coordinated with the owners of Clinton Mills Dam.

NAPEN-N
Honorable Brendan T. Byrne

d. A detailed topographic survey of the dike and the area around the dike should be made within six months from the date of approval of this report. The survey should become part of the permanent records of the dike.

e. A detailed slope stability analysis of the embankment should be performed by a professional consultant, engaged by the owner, within six months from the date of approval of this report. The analysis should include any necessary subsurface investigation to assess the stability of the embankment during high river stage conditions. Any remedial measures found necessary by the analysis should be initiated within three months of study completion.

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Inspection Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

1 Incl
As stated

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Regulation
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

CLINTON MILLS DIKE (NJ00564)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dike was inspected on 5 and 28 December 1979 by Storch Engineers under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Clinton Mills Dike, a high hazard potential structure, is judged to be in fair overall condition. The spillway for the dike is located at Clinton Mills Dam (NJ00122) approximately 70 feet downstream from the dike. To ensure adequacy of the dike, the following actions, as a minimum, are recommended:

a. The following remedial measures should be initiated within six months from the date of approval of this report:

(1) Trees and brush should be removed from the embankment and the embankment surfaces should be suitably stabilized.

(2) A design for regrading of the embankment should be prepared by a professional engineer experienced in the design and construction of dams, and the embankment should be regraded accordingly.

b. The owners should develop written operating procedures and a periodic maintenance plan to ensure the safety of the dike within one year from the date of approval of this report.

c. Arrangements should be made to form an agreement among the three apparent owners of the dike that would specify responsibilities for maintenance, record keeping and cost sharing for remedial work. The agreement should also specify any necessary easements for construction and maintenance. Remedial work should also be coordinated with the owners of Clinton Mills Dam.

d. A detailed topographic survey of the dike and the area around the dike should be made within six months from the date of approval of this report. The survey should become part of the permanent records of the dike.

e. A detailed slope stability analysis of the embankment should be performed by a professional consultant, engaged by the owner, within six months from the date of approval of this report. The analysis should include any necessary subsurface investigation to assess the stability of the embankment during high river stage conditions. Any remedial measures found necessary by the analysis should be initiated within three months of study completion.

APPROVED: _____

JAMES G. TON
Colonel, Corps of Engineers
for District Engineer

DATE: _____

PHASE I REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Clinton Mills Dike, NJ00564
State Located:	New Jersey
County Located:	Hunterdon
Drainage Basin:	Raritan River
Stream:	South Branch Raritan River
Dates of Inspection:	December 5, 1979
	December 28, 1979

Assessment of General Condition of Dike

Based on visual inspection, past records and Phase I engineering analyses, Clinton Mills Dike is assessed as being in fair overall condition.

The spillway discharging water from the impoundment of the dike is located at Clinton Mills Dam (NJ00122), approximately 70 feet downstream from Clinton Mills Dike.

Hydraulic and hydrologic analyses indicate that the spillway at Clinton Mills Dam is inadequate. The spillway is not adequate to pass the designated Spillway Design Flood (SDF) without overtopping the dam. (The SDF for Clinton Mills Dike is equal to one-half the probable maximum flood.) The spillway is capable of passing approximately 4 percent of the probable maximum flood or 8 percent of the SDF. Therefore, the owner should engage a professional engineer experienced in the design and construction of dams, in the near future, to perform more accurate hydraulic and hydrologic analyses. Based on the findings of the analyses, the need for and type of remedial measures should be determined and then implemented.

The owners should, in the near future, develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dike.

In addition, it is recommended that the owners, in the near future, undertake the following remedial measures:

1) Trees and brush should be removed from the embankment and the embankment surfaces should be suitably stabilized.
2) A design for a regrading of the embankment should be prepared by a professional engineer experienced in the design and construction of dams, and the embankment should re regraded accordingly.

In addition to Clinton Mills Dike, a dam known as Clinton Mills Dam, located immediately downstream from the dike, impounds the river. Remedial measures to correct the inadequate conditions of Clinton Mills Dike should be performed in conjunction with remedial measures for the dam as specified in "Clinton Mills Dam, NJ00122, Phase I Inspecton Report, National Dam Safety Program," dated March 1980.

Arrangements should be made very soon to form an agreement among the three apparent owners of the dam that would specify reponsibilities for maintenance, record keeping and cost sharing for remedial work. The agreement should also specify any necessary easements for construction and maintenance.

In the near future, the owners of the dike should develop written operating procedures and a periodic maintenance plan to insure the safety of the dike.

A detailed topographic survey of the dike and the area around the dike should be undertaken in the near future by a qualified licensed land surveyor or professional engineer. The survey should become part of the permanent records of the dike.

A detailed slope stability analysis of the embankment should be performed in the near future by a professional engineer experienced in the design and construction of dams. The analysis should include any necessary subsurface investigation to assess the stability of the embankment during high river stage conditions.

Richard J. McDermott, P.E.

John E. Gribbin, P.E.

OVERVIEW - CLINTON MILLS DIKE

28 DECEMBER 1979

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PREFACE

This report is prepared under guidance contained in the Recommended *Guidelines for Safety Inspection of Dams, for Phase I Investigations.* Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that the unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

CLINTON MILLS DIKE, I.D. NJ00564

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The Division of Water Resources of the New Jersey Department of Environmental Protection (NJDEP) in cooperation with the Philadelphia District of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the State of New Jersey. Storch Engineers has been retained by the NJDEP to inspect and report on a selected group of these dams. The NJDEP is under agreement with the Philadelphia District of the Corps of Engineers.

b. Purpose of Inspection

The visual inspections of Clinton Mills Dike were made on December 5 and December 28, 1979. The purpose of the inspections was to make a general assessment of the structural integrity and operational adequacy of the dike structure and its appurtenances.

1.2 Description of Project

a. Description of Embankment

Clinton Mills Dike is an earthfill embankment located along the left, or east, bank of the South Branch Raritan River upstream from Clinton Mills Dam (NJ00122). The 320-foot long dike is aligned approximately north-south and abuts a former mill building at its south end and blends into the east river bank at its north end. The crest elevation varies from 191.8 to 193.2 National Geodetic Vertical Datum (N.G.V.D.)

A paved road (Center Street) is located along the toe of the dike for its entire length. A small frame building containing an office is located on the embankment at its approximate center and a frame dwelling is located at the toe near the south end.

The dike contains on spillway or outlet works. Spillway and outlet facilities for the impoundment are located at Clinton Mills Dam.

b. Location

Clinton Mills Dike is located in the Town of Clinton, Hunterdon County, New Jersey. Constructed along the east bank of the South Branch, Raritan River, the dike protects the Center Street area of Clinton against flooding during high river stages. Access to the Dike is by Center Street, a local road in the commercial area of Clinton.

c. Size and Hazard Classification

Size and Hazard Classification criteria presented in "Recommended Guidelines for Safety Inspection of Dams," published by the U.S. Army Corps of Engineers are as follows:

SIZE CLASSIFICATION

	Impoundment	
	Storage (Ac-ft)	Height (Ft.)
Small	< 1000 and ≥ 50	< 40 and ≥ 25
Intermediate	≥ 1000 and $< 50,000$	≥ 40 and < 100
Large	$\geq 50,000$	≥ 100

HAZARD POTENTIAL CLASSIFICATION

Category	Loss of Life (Extent of Development)	Economic Loss (Extent of Development)
Low	None expected (no permanent structures for human habitation	Minimal (Undeveloped to to occasional structures or agriculture)
Significant	Few (No urban developments and no more than a small number of inhabitable structures	Appreciable (Notable agriculture, industry or structures)
High	More than a small number	Excessive (Extensive community, industry or agriculture)

The following data relating to size and downstream hazard for Clinton Mills Dike have been determined for this Phase I assessment:

Storage: 91 Acre-feet

Height: 7.8 feet

Potential Loss of Life:

A frame office building and a frame dwelling are located along the dike and a portion of the commercial center of Clinton is located downstream from the dike within 200 feet. Failure of the dike could cause loss of life.

Potential Economic Loss:

The frame office building and frame dwelling could sustain heavy damage as a result of failure of the dike. Downstream commercial development could sustain significant damage as a result of failure of the dike.

Therefore, Clinton Mills Dam is classified as "Small" size and "High" hazard potential.

d. Ownership

Clinton Mills Dike is located within 3 lots as shown on the Town of Clinton Tax Map. Accordingly, the dike is owned by the following property owners:

Lot	Name	Address
1	Hunterdon Art Center	7 Center Street, Clinton, N.J.
2	Emma Miller	9 Center Street, Clinton, N.J.
3	Francis Pisani	11 Lower Center Street, Clinton, N.J.

e. Purpose of Dike

The purpose of the dike is the prevention of flooding due to high river stages in the South Branch Raritan River.

f. Design and Construction History

No design or construction history is available. Reportedly, the dike was constructed prior to 1949.

g. Normal Operational Procedures

The dike is maintained by private property owners. There is no fixed schedule of maintenance, repairs are made as the need arises

1.3 Pertinent Data

a. Drainage area — 111 sq. miles

b. Discharge at damsite

Maximum known flood	8080 c.f.s. (Aug. 19. 1955)
Outlet works at pool elevation	N.A.
Spillway capacity at top of dike	N.A.

c. Elevation (N.G.V.D.)

Top of dike	Varies: 191.8 to 193.2
Maximum pool-design surcharge	200.4
Normal pool	188.4
Spillway crest	N.A.
Maximum tailwater	N.A.
Toe of dike	185.4

d. Reservoir

Length of maximum pool	5000 feet ± (Impoundment is a reach of the South Branch Raritan River)

e. Storage (Acre-feet)

Normal pool	21 Acre-feet
Design surcharge	859 Acre-feet
Top of dike	91 Acre-feet

f. Reservoir Surface (Acres)

Top of dike	44 Acres±
Maximum pool-design surcharge	154 Acres±
Normal pool	10 Acres±

g. Dike

Type	Earthfill
Length	320 feet
Height	7.8 feet
Side slope - Upstream	2 horiz. to 1 vert.
- Downstream	3 horiz. to 1 vert.
Zoning	Unknown
Impervious core	Unknown
Cutoff	Unknown
Grout curtain	Unknown

h. Diversion and Regulating Tunnel N.A.

i.	Spillway	None
	Type	N.A.
	Length of weir	N.A.
	Crest elevation	N.A.
	Gates	N.A.
	Approach channel	N.A.
	Discharge channel	N.A.
j.	Regulating Outlets	None

SECTION 2: ENGINEERING DATA

2.1 Design

No plans or calculations pertaining to the design of Clinton Mills Dike are available.

2.2 Construction

No construction drawings or construction inspection reports are available.

2.3 Operation

Inspection reports and correspondence relating to the dike are available in the NJDEP file for Clinton Mills Dam.

An inspection report by the State of New Jersey dated June 3, 1940 indicated that severe damage was sustained by Main Street as a result of the storm of March 1940. The dike and wall along the left bank of the river were too low in the opinion of the inspection.

Another inspection report by the State of New Jersey dated September 29, 1942 expressed the opinion that the dike was probably high enough. According to the report, during high river stage, water overflows the low point in Halstead Street and passes along Center Street to Main Street. In later correspondence, the State Water Policy Commission indicated that the "earth embankments and walls along the southeasterly side of the mill pond should be maintained with their tops at elevation 197.0, that is 2.0 feet higher than the underside of the girders of the Halstead Street bridge."

The Water Policy Commission recommended that a new dike, with top width no less than 4 feet and crest elevation at 197.0, be constructed along the left bank at the second property west of the

Halstead Street bridge where no dike existed at that time. (The second property west of the Halstead Street bridge appears to be the present Lot 3, Block 9.)

2.4 Evaluation

a. Availability

Available engineering information is limited to that which is in the file for Clinton Mills Dam at the NJDEP. The file contains inspection reports and correspondence relating to Clinton Mills Dike.

b. Adequacy

Available engineering data pertaining to Clinton Mills Dike are of limited assistance in the performance of a Phase I evaluation. A list of absent information is included in paragraph 7.1.b.

c. Validity

The second property west of the Halstead Street bridge was found to contain the northern portion of the dike at the time of inspection. That portion of the dike appears to have been constructed since the correspondence was written in 1942. The crest elevation, as estimated from a USGS quadangle, for the present Phase I evaluation, is 193.2. Using the same datum, the elelvation of the underside of the girders of the Halstead Street bridge is 194.7 which is in close agreement with the elevation used in the 1942 correspondence. (The bridge was constructed in 1932.) However, the agreement could be coincidence and no other evidence has been found to indicate that the datum used at present agrees with that used in 1942.

Vertical datum notwithstanding, the present evaluation has indicated that the highest portion of the dike is 1.5 feet below the underside of the girders of the Halstead Street bridge. No portion of the dike is 2.0 feet above the underside of the girders as indicated in the 1942 correspondence.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The inspections of Clinton Mills Dike were performed on December 5 and December 28, 1979 by staff members of Storch Engineers. A copy of the visual inspection check-list is contained in Appendix 1. The following procedures were employed for the inspections:

1) The embankment and adjacent areas were examined.
2) Elevations of the embankment and adjacent areas were determined with the use of a hand level.
3) The embankment and adjacent areas were photographed.

b. Embankment

The south section of the dike is irregular in crest elevation, varying from 193.2 to 191.8. The north section was generally level with a crest elevation of 193.2.

The north section was uniformly graded and covered with a good stand of grass and a few trees. The south section was irregularly graded and generally covered with brush and trees with some bare areas. The south section was in generally deteriorated condition. Significant erosion of portions of the crest and downstream face was observed. A portion of the downstream face appeared to be partially filled with coal ashes.

c. Appurtenant Structures

Clinton Mills Dike contains no spillway or outlet works. Facilities for discharge and outlet of the impoundment are located at Clinton Mills Dam.

d. Reservoir Area

Clinton Mills Dike is located on the left, or east, bank of the South Branch of Raritan River at its confluence with the discharge channel from Spruce Run Dam. The reach of river impounded by the dike is also impounded by Clinton Mills Dam, located immediately downstream. The right, or west, river bank opposite the dike was swampy and wooded with generally flat slopes. A concrete road bridge (Halstead Street) is located approximately 150 feet upstream from the dike.

e. Downstream Area

Immediately downstream from the dike is a paved road (Center Street) and beyond the road lies Main Street and a portion of the commercial center of Clinton. Several buildings in the commercial section are located in the flood plain of the dike.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

The level of water in impoundment of Clinton Mills Dike is regulated naturally by discharge over the spillway located at Clinton Mills Dam. No regulation of the impoundment takes place at the dike.

4.2 Maintenance of the Dike

Maintenance of the dike is performed by the three property owners whose property contains the dike. The frequency of maintenance is not known and no maintenance records are available.

4.3 Maintenance of Operating Facilities

N.A.

4.4 Description of Warning System

Reportedly, no warning system is in use at the present time.

4.5 Evaluation of Operational Adequacy

Operation of the dike has not been successful to the extent that it has been overtopped several times in the past. Reportedly, it was overtopped at least twice during the past three years.

Maintenance documentation is poor and maintenance of the dike appears to be insufficient in the following areas:

1) Trees and brush on embankment.
2) Erosion and deterioration of crest and downstream face on south section.

SECTION 5: HYDRAULIC/HYDROLOGIC

5.1 Evaluation of Features

a. Design Data

Size and hazard classification were used in conjunction with "Recommended Guidelines for Safety Inspection of Dams" published by the U.S. Army Corps of Engineers to establish the SDF (Spillway Design Flood) for Clinton Mills Dike. The appropriate SDF range for this facility is 1/2 PMF to PMF (Probable Maximum Flood). Since the characteristics for Clinton Mills Dike as described in paragraph 1.2.c., fall in the lower end of their prescribed ranges, 1/2 PMF is used as the SDF.

The SDF peak inflow computed for Clinton Mills Dike is 59500 c.f.s. This value is derived from the PMF hydrograph supplied by the Corps of Engineers in "Raritan River Report," 1971 by the N. Y. District, Corps of Engineers.

Reservoir storage capacities were estimated using surface areas measured from USGS quadrangles. Discharge rates for the spillway located at Clinton Mills Dam were computed by the use of a weir formula appropriate to the configuration of its overflow section. (See Appendix 4). Calculations of the stage-discharge curve for the dam includes overtopping of the left training wall of the dam as well as the spillway.

The SDF inflow hydrograph was routed through the spillway at Clinton Mills Dam using the HEC-1-DB computer program. For overtopping analysis, the overall length of dike crest includes the dike and a portion of the right bank of the impoundment. The elevation of the crest of dike was assumed to be that of its low point (191.8). The routing indicated

that the dike would be overtopped by the SDF. Computations show that overtopping in a non-breach condition would occur for about 27 hours with a maximum height above the dike crest of approximately 8.6 feet. Dike failure resulting from overtopping would not significantly increase the hazard to loss of life downstream over that which would exist without failure. Accordingly, the spillway at Clinton Mills Dam is assessed as being inadequate in accordance with criteria developed by the U.S. Army Corps of Engineers.

b. Experience Data

Reportedly, Clinton Mills Dike has been overtopped twice within the past three years. According to Town of Clinton maintenance personnel, a depth of 1 foot of overtopping occurred in 1979. Center Street was completely inundated along the dike at that time. Also, the dike was overtopped during a storm in 1940. At that time, severe damage to Main Street was reported.

c. Visual Observation

At the time of the field inspection deterioration of the crest and downstream face of the south section of the dike was observed. The deterioration could be caused by overtopping.

d. Overtopping Potential

As indicated above, a storm of magnitude equal to the SDF would cause overtopping of the dike to a depth of 8.6 feet in a non-breach condition. The spillway at the dam is capable of passing approximately 8 percent of the SDF with impoundment level equal to the crest of dike.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

In general, the dike appeared to be outwardly structurally stable. Low areas along the crest and downstream side of embankment appeared to be a result of erosion.

b. Design and Construction Data

Analysis of structural stability and construction data for the embankment are not available.

c. Operating Records

No operation is performed in connection with the dike due to the absence of a spillway and outlet works.

d. Post Construction Changes

No post construction records pertaining to Clinton Mills Dike are available.

e. Seimsic Stability

Clinton Mills Dike is located in Seismic Zone 1 as defined in "Recommended Guidelines for Safety Inspection of Dams" which is a zone of very low seismic activity. Experience indicates that dams in Seismic Zone 1 will have adequate stability under seismic loading conditions if stable under static loading conditions. Clinton Mills Dike, at the the time of inspection, appeared to be stable under static loading conditions.

SECTION 7: ASSESSMENT AND RECOMMENDATIONS

7.1 Dike Assessment

a. Safety

Based on hydraulic and hydrologic analyses outlined in Section 5 and Appendix 4 the spillway at Clinton Mills Dam is assessed as being inadequate. The spillway is not able to pass the SDF designated for the dam or the dike without an overtopping of both the dam and the dike.

In general, the dike appeared to be outwardly structurally stable at the time of inspection. However, due to the absence of engineering data, stability under high river stage conditions could not be assessed.

b. Adequacy of Information

Information sources for this study include: 1) field inspections, 2) USGS quadrangle, 3) aerial photography from Hunterdon County, 4) consultation with Public Works Department, Town of Clinton and 5) inspection reports and correspondence in NJDEP file for Clinton Mills Dam.

The information obtained is sufficient to allow a Phase I assessment as outlined in "Recommended Guidelines for Safety Inspection of Dams."

Some of the absent data are as follows:

1) Design computations and reports.
2) Maintenance documentation.
3) Design and construction drawings.
4) Soils report.

c. Necessity for Additional Data/Evaluation

Further slope stability investigations should be performed to assess the stability of the dike under SDF river stage conditions.

7.2 Recommendations

a. Remedial Measures

Based on hydraulic and hydrologic analyses outlined in paragraph 5.1.a. and Appendix 4, the spillway for Clinton Mills Dam is considered to be inadequate. Therefore, it is recommended that a professional engineer experienced in the design and construction of dams be engaged in the near future to perform more accurate hydraulic and hydrologic analyses. Based on the findings of the analyses, the need for and type of remedial measures should be determined and then implemented.

The owners should, in the near future, develop an emergency action plan together with an effective warning system outlining actions to be taken by the operator to minimize downstream effects of an emergency at the dike.

In addition, it is recommended that the owners, in the near future, undertake the following remedial measures:

1) Trees and brush should be removed from the embankment and the embankment surfaces should be suitably stabilized.

2) A design for regrading of the embankment should be prepared by a professional engineer experienced in the design and construction of dams, and the embankment should be regraded accordingly.

In addition to Clinton Mills Dike, a dam known as Clinton Mills Dam, located approximately 70 feet downstream from the dike, impounds the river. Remedial measures to correct the inadequate conditions of Clinton Mills Dike should be performed in conjunction with remedial measures for the dam as specified in "Clinton Mills Dam, NJ00122, Phase I Inspection Report, National Dam Safety Program," dated March 1980.

b. Maintenance

In the near future, the owners of the dike should develop written operating procedures and a periodic maintenance plan to insure the safety of the dike.

c. Additional Studies

Arrangements should be made very soon to form an agreement among the three apparent owners of the dam that would specify reponsibilities for maintenance, record keeping and cost sharing for remedial work. The agreement should also specify any necessary easements for construction and maintenance.

A detailed topographic survey of the dike and the area around the dike should be undertaken in the near future by a qualified licensed land surveyor or professional engineer. The survey should become part of the permanent records of the dike.

A detailed slope stability analysis of the embankment should be performed in the near future by a professional engineer experienced in the design and construction of dams. The analysis should include any necessary subsurface investigation to assess the stability of the embankment during high river stage conditions.

PLATES

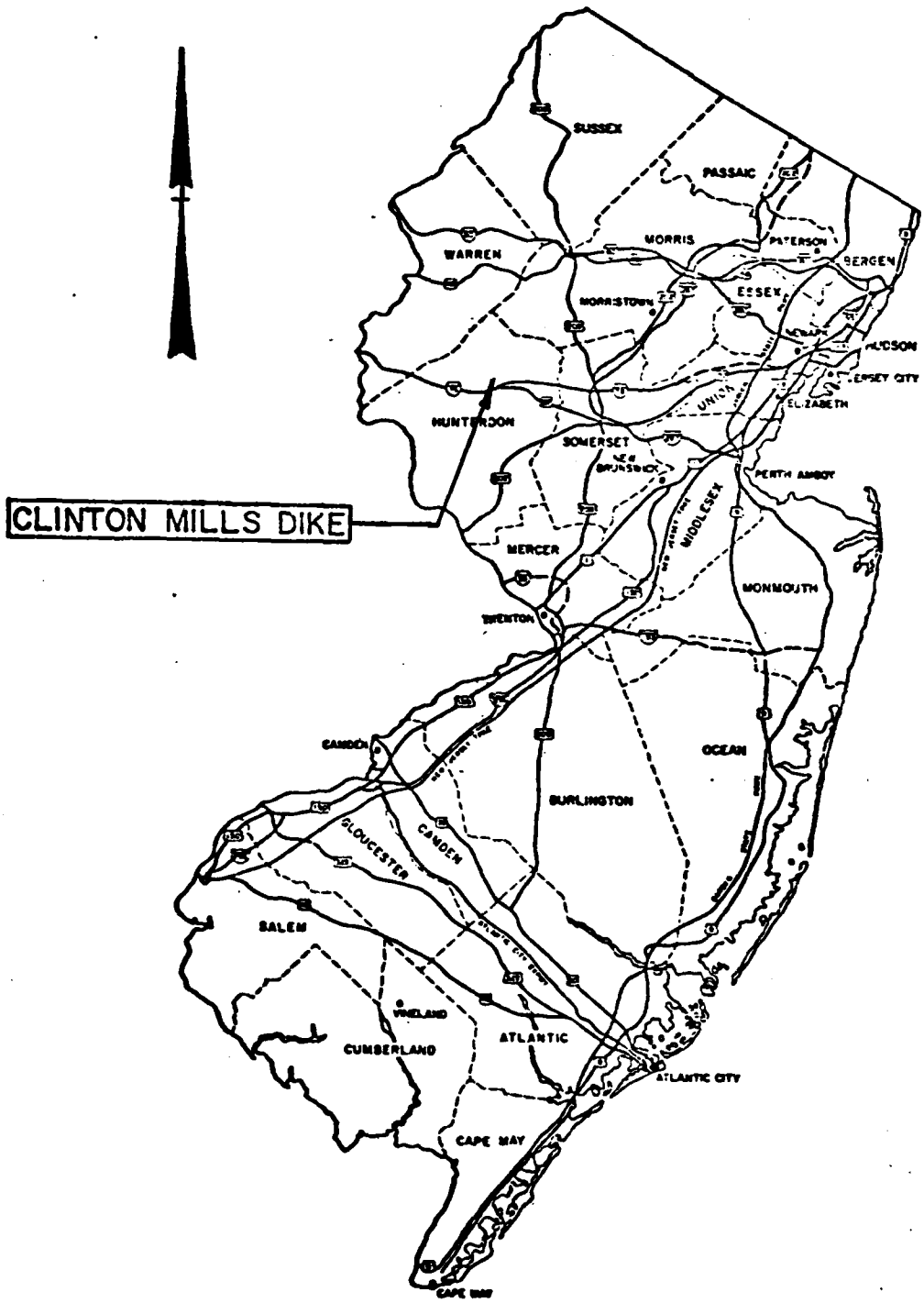


PLATE 1

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

KEY MAP

CLINTON MILLS DIKE

I.D. N.J. 00564	SCALE: NONE
	DATE: JAN. 1980

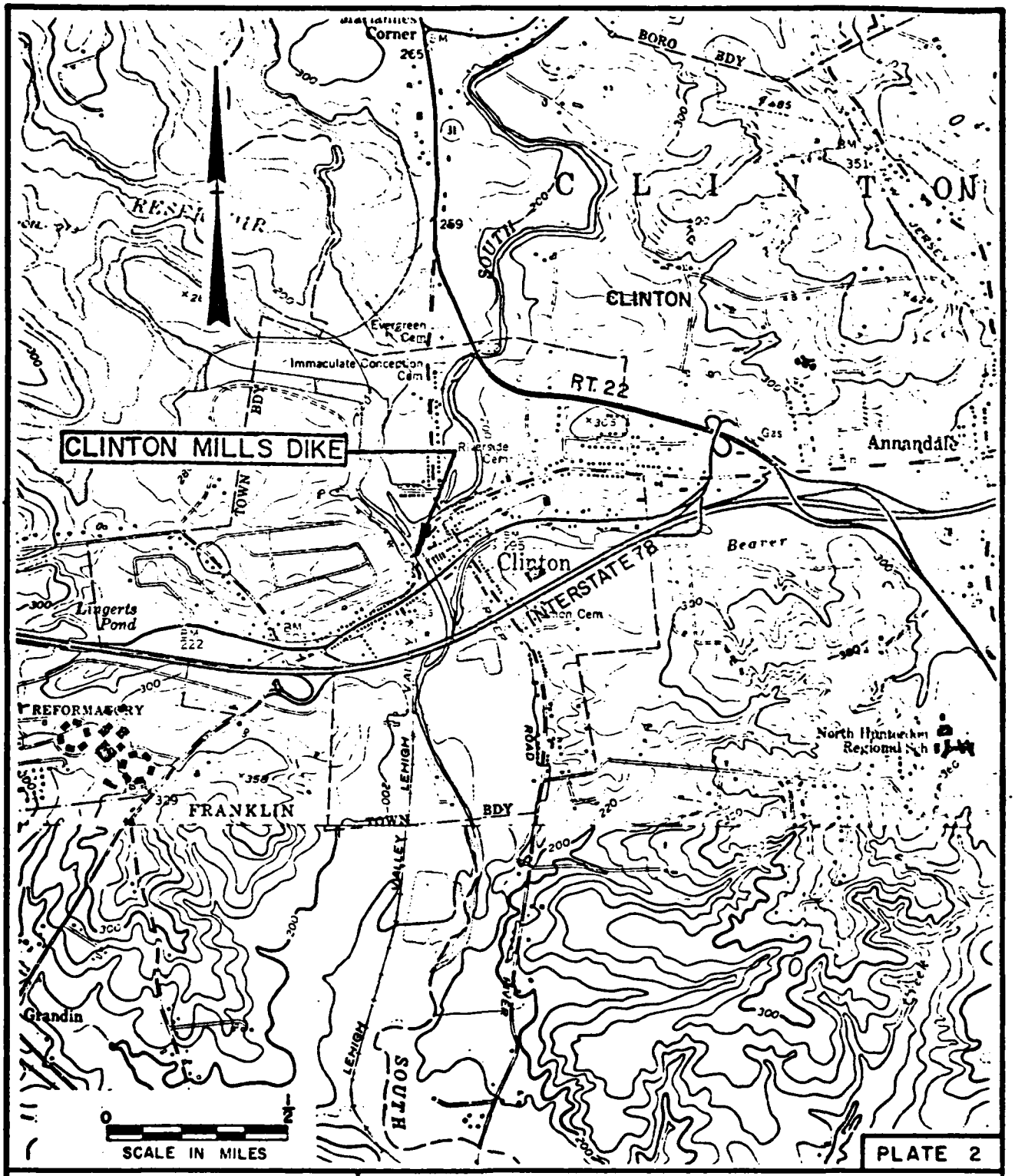


PLATE 2

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

VICINITY MAP

CLINTON MILLS DIKE

I.D. N.J. 00564	SCALE: AS SHOWN
	DATE: JAN. 1980

Legend

AR Recent alluvium composed of stratified materials deposited by streams.

Sl-47 Silty clays and silts overlying limestone bedrock identified as Kittatiny limestone.

NOTE: Information taken from Rutgers University Soil Survey of New Jersey, Report No. 6, Hunterdon County, and Geologic Map of New Jersey prepared by Lewis and Kummel.

PLATE 3

STORCH ENGINEERS
FLORHAM PARK, NEW JERSEY

DIVISION OF WATER RESOURCES
N.J. DEPT. OF ENVIR. PROTECTION
TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

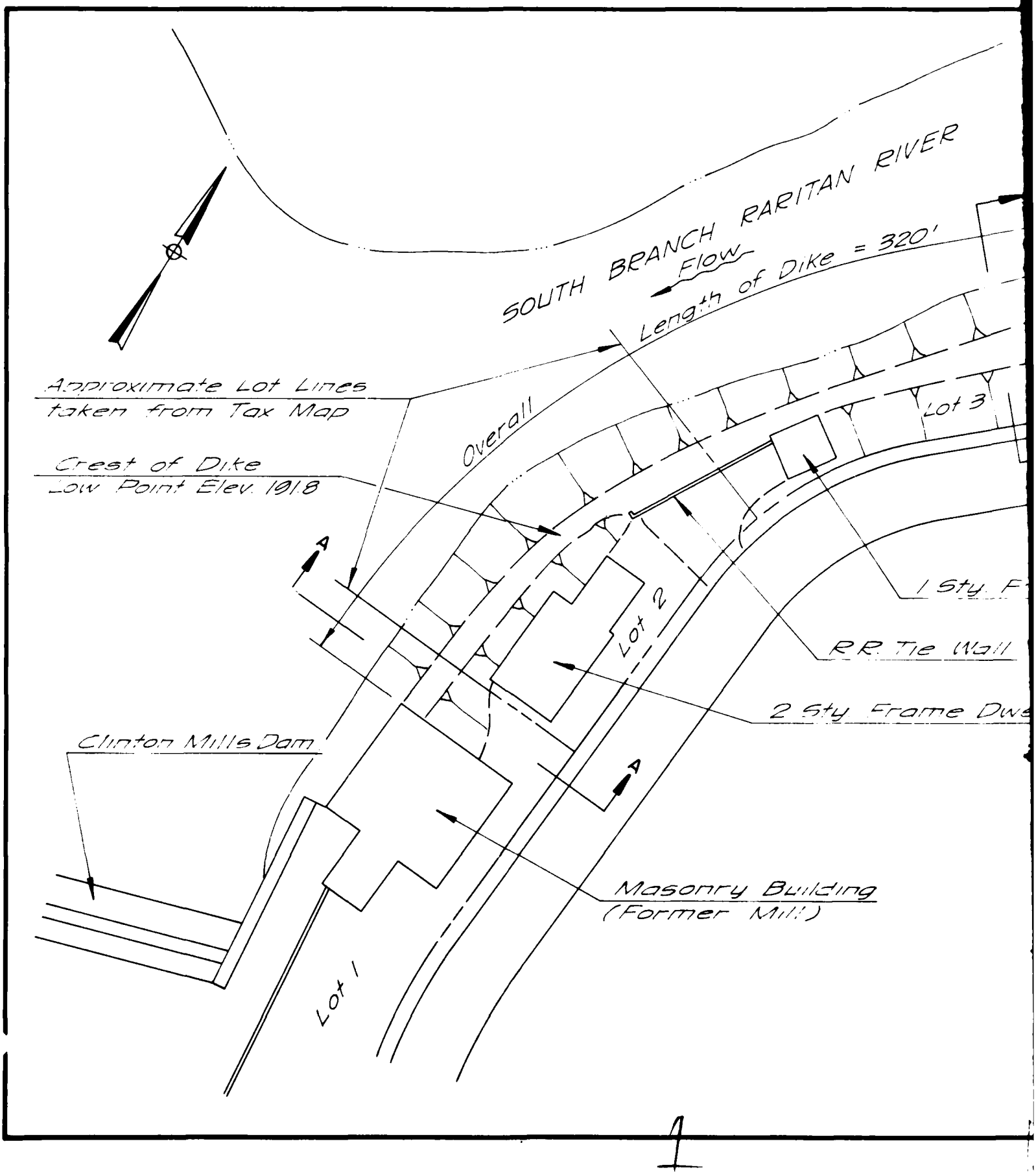
SOIL MAP

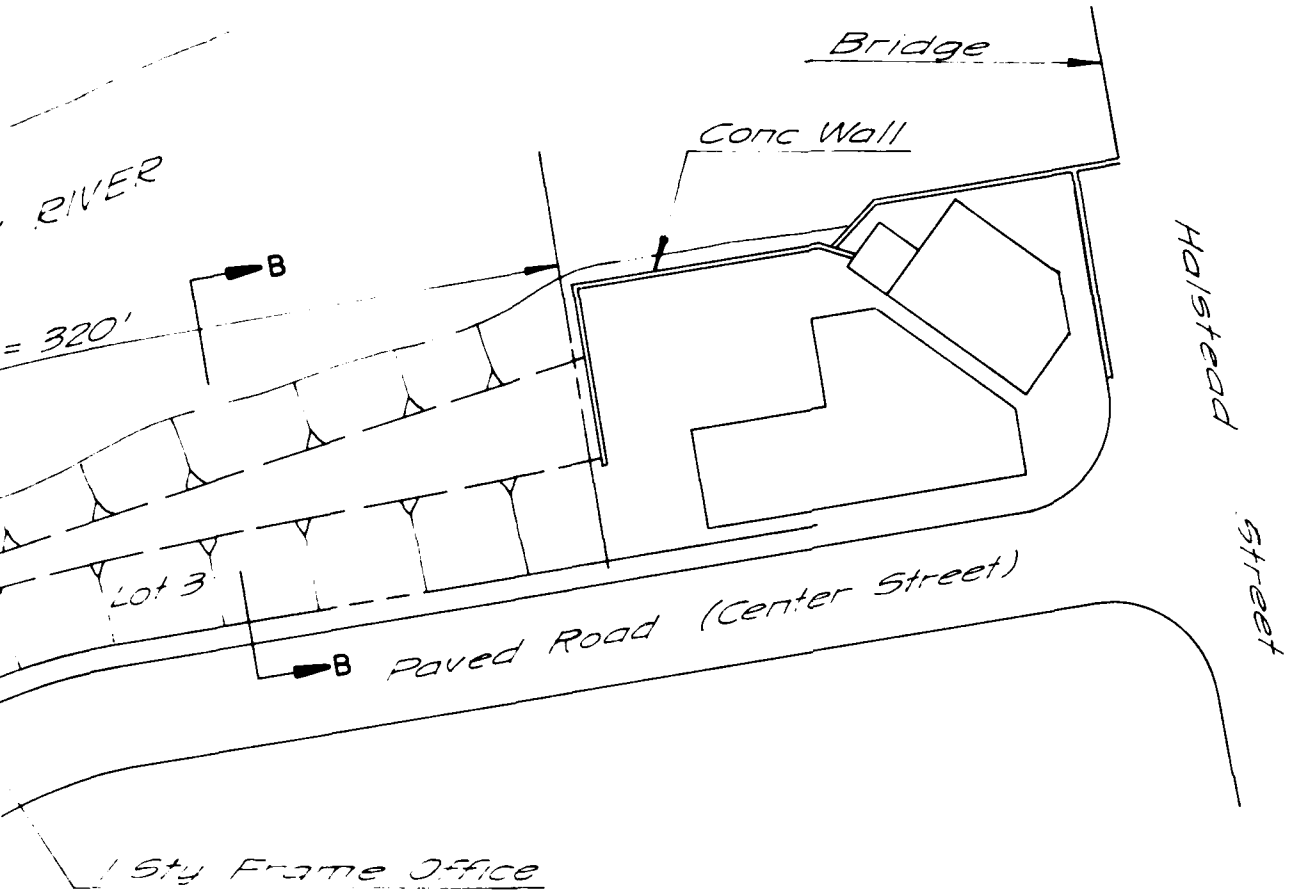
CLINTON MILLS DIKE

I.D. NJ00564

SCALE: NONE

DATE: JAN. 1980


SOUTH BRANCH RARITAN RIVER
Flow
Length of Dike = 320'
Approximate Lot Lines
taken from Tax Map
Crest of Dike
Low Point Elev. 101.8
Overall
Lot 3
Lot 2
Lot 1
1 Sty. F
R.R. Tie Wall
2 Sty. Frame Dwe
Clinton Mills Dam
Masonry Building
(Former Mill)
A
A



Note:
1. Information taken from plan by John E. Struder, P.E., Sept. 1949, Tax Map of the Town of Clinton and field inspections Dec 5 & 28, 1979.

PLATE 4

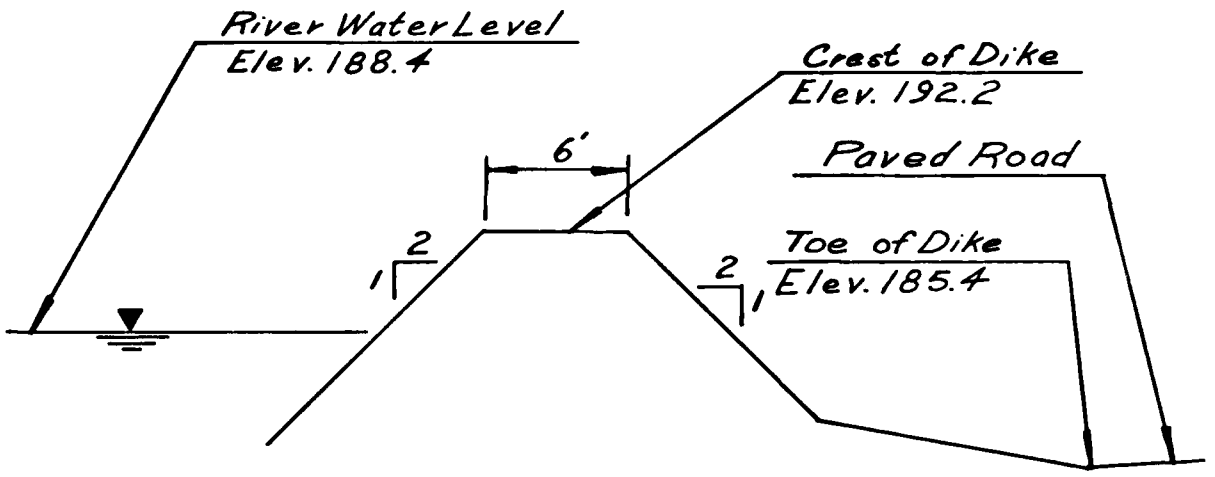
STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

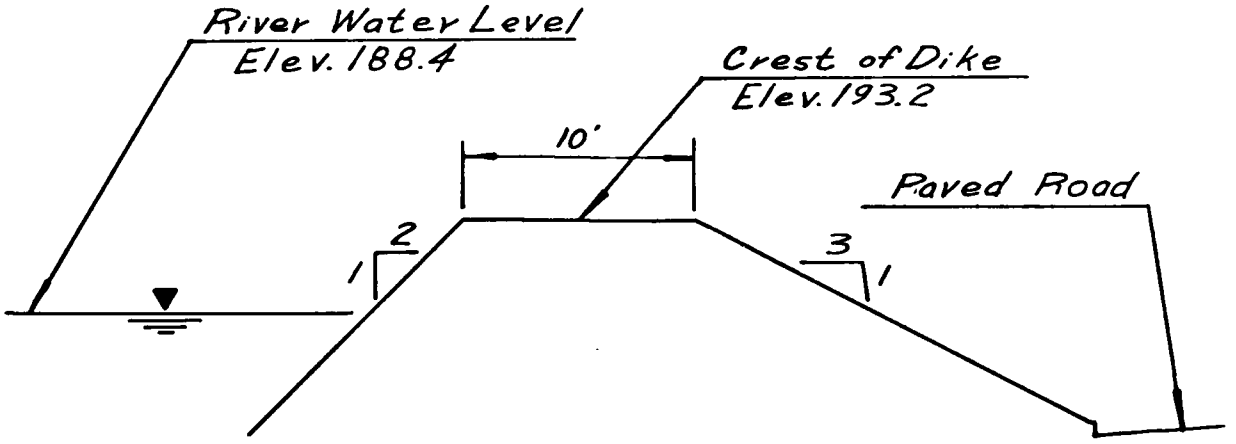
GENERAL PLAN

CLINTON MILLS DIKE

I D N J 00564	SCALE NOT TO SCALE
	DATE JAN 1980



SECTION A-A

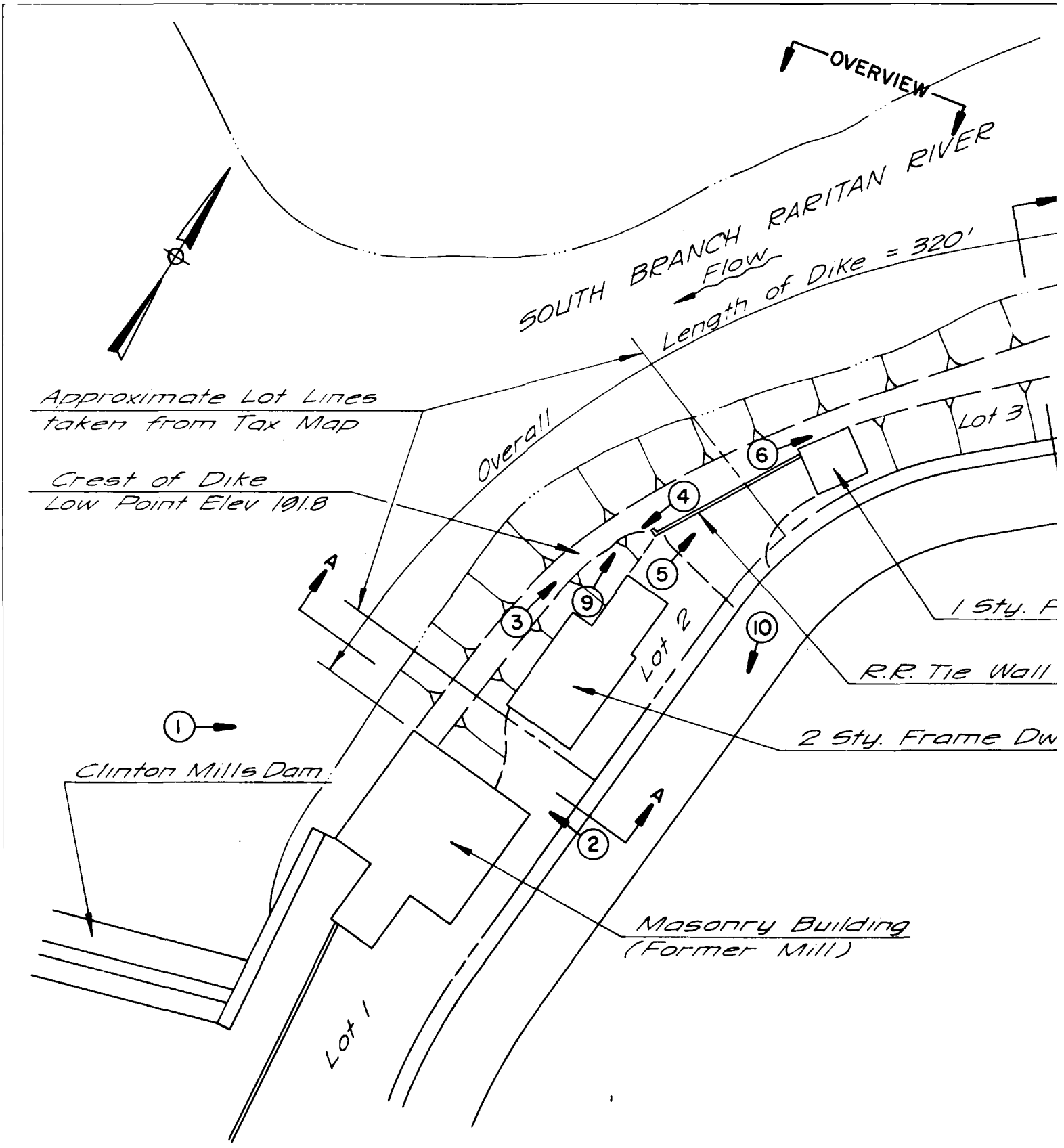


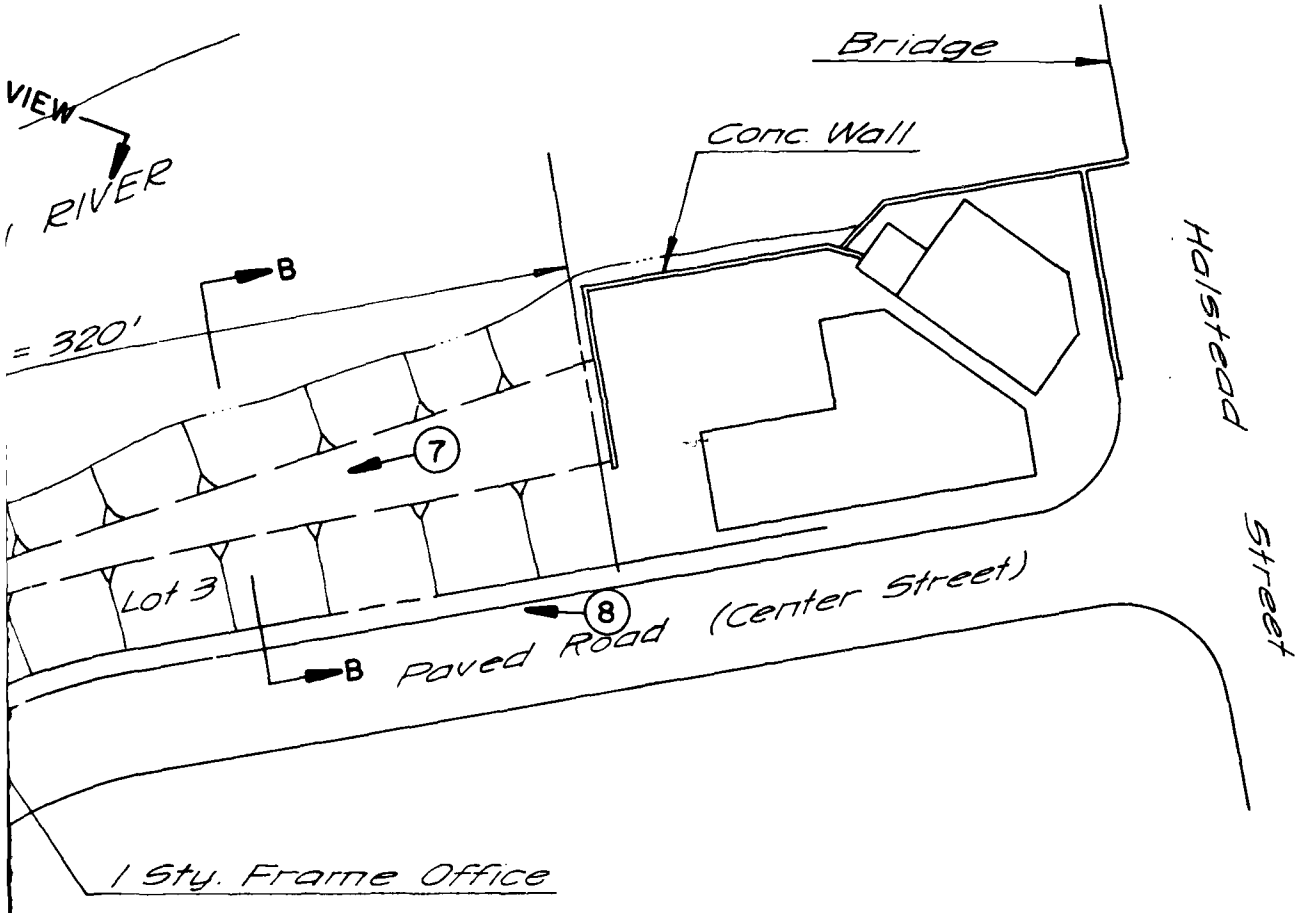
SECTION B-B

Notes:
1. Information taken from field inspection December 5, 1979.
2. Elevations based on N.G.V.D. estimated from U.S.G.S. quadrangle.

PLATE 5

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	INSPECTION AND EVALUATION OF DAMS **SECTIONS** CLINTON MILLS DIKE
DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY	I.D. N.J. 00564 — SCALE: NOT TO SCALE DATE: JAN. 1980


OVERVIEW
SOUTH BRANCH RARITAN RIVER
Flow
Length of Dike = 320'
Approximate Lot Lines
taken from Tax Map
Crest of Dike
Low Point Elev 101.8
Overall
Lot 3
6
4
5
9
3
10
A
A
Lot 2
1 Sty. F
R.R. Tie Wall
2 Sty. Frame Dw
1
Clinton Mills Dam
2
Masonry Building
(Former Mill)
Lot 1



Note:
1. Information taken from plan by John E. Struder, P.E., Sept. 1949, Tax Map of the Town of Clinton and field inspections Dec. 5 & 28, 1979.

79

PLATE 6

STORCH ENGINEERS FLORHAM PARK, NEW JERSEY	DIVISION OF WATER RESOURCES N.J. DEPT. OF ENVIR. PROTECTION TRENTON, NEW JERSEY

INSPECTION AND EVALUATION OF DAMS

PHOTO LOCATION PLAN

CLINTON MILLS DIKE

I. D. N.J. 00564	SCALE: NOT TO SCALE
	DATE: JAN. 1980

APPENDIX 1

Check List - Visual Inspection
Check List - Engineering Data

Check List
Visual Inspection
Phase I

Name of Dam Clinton Mills Dike County Hunterdon State New Jersey Coordinators NJDEP

Date(s) Inspection 12/5/79
12/28/79 Weather P-Cloudy Temperature 45°F

Pool Elevation at Time of Inspection 188.4 M.S.L. Tailwater at Time of Inspection N.A. M.S.L.

Inspection Personnel:

John Gribbin

Richard McDermott

Alan Volle

J. Gribbin Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
GENERAL	North section covered with good stand of grass and some trees. South section generally covered with brush and trees with some bare areas.	Recommend removal of trees and brush.
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	South end of dike abuts stone masonry mill building. Junction appeared sound. North end blends into earth and concrete-wall bank of river.	
ANY NOTICEABLE SEEPAGE	None observed	
STAFF GAGE AND RECORDER	None observed	
DRAINS	None observed	

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	None observed	
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None observed	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	South section of dike was in generally deteriorated condition. Significant erosion of portions of the crest and downstream face was observed. Portion of downstream face appeared to be partially filled with coal ashes.	Recommend regrading of embankment.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Vertical: North section - level South section - irregular; approx. 1 foot variation Horizontal: Follows alignment of east bank of river.	
RIPRAP FAILURES	No riprap observed	

OUTLET WORKS

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE SURFACES IN OUTLET CONDUIT	N.A.	Outlet used to lower impoundment is located at Clinton Mills Dam.
INTAKE STRUCTURE	N.A.	
OUTLET STRUCTURE	N.A.	
OUTLET CHANNEL	N.A.	
GATE AND GATE HOUSING	N.A.	

SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
GENERAL	N.A.	Dike does not contain a spillway. Spillway for impoundment located at Clinton Mills Dam.

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None	
OBSERVATION WELLS	None	
WEIRS	None	
PIEZOMETERS	None	
OTHER	N.A.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	The right river bank was swampy and wooded with generally flat slopes.	Impoundment consists of the South Branch Raritan River which is also the impoundment of Clinton Mills Dam.
SEDIMENTATION	Amount of sedimentation in the vicinity of the dike is unknown.	
STRUCTURES ALONG BANKS	A public road bridge is located on the river approx. 150 feet upstream from the north end of the dike. A frame dwelling and a small frame office building are located along the dike. Two other frame dwellings are located along the left river bank between the dike and the road bridge.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Discharge over the dike would flow over Center St. (Clinton) and onto Main St. and then re-enter the South Branch Raritan River downstream from Clinton Mills Dam.	No channel downstream from dike.
SLOPES	N.A.	
STRUCTURES ALONG BANKS	Several buildings in the commercial section of Clinton are located in the downstream flood plain of the dike.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM		REMARKS
DAM -	PLAN	Not available
	SECTIONS	
SPILLWAY -	PLAN	N.A.
	SECTIONS	
	DETAILS	
OPERATING EQUIPMENT PLANS & DETAILS		N.A.
OUTLETS -	PLAN	N.A.
	DETAILS	
	CONSTRAINTS	
	DISCHARGE RATINGS	
HYDRAULIC/HYDROLOGIC DATA		PMF provided by Corps of Engineers from "Raritan River Report," 1971, N.Y. District. Also, gaging data available for South Branch Raritan River.
RAINFALL/RESERVOIR RECORDS		Not available
CONSTRUCTION HISTORY		Not available
LOCATION MAP		Available - Town of Clinton

ITEM	REMARKS
DESIGN REPORTS	Not available
GEOLOGY REPORTS	Not available
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	Not available
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	Not available
POST-CONSTRUCTION SURVEYS OF DAM	Not available
BORROW SOURCES	Not available

ITEM	REMARKS
MONITORING SYSTEMS	Stream gages in South Branch Raritan River upstream and downstream. Upstream: Near High Bridge, about 4 miles upstream Downstream: At Stanton, about 6 miles downstream.
MODIFICATIONS	Not available
HIGH POOL RECORDS	Not available
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	Not available
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	Description of overtopping and flood damage available in NJDEP file for Clinton Mills Dam.
MAINTENANCE OPERATION RECORDS	Not available

APPENDIX 2

Photographs

PHOTO 1

UPSTREAM FACE OF DIKE - LOOKING NORTH

PHOTO 2

DOWNSTREAM FACE OF DIKE BETWEEN MILL BUILDING AND FRAME DWELLING

CLINTON MILLS DIKE
28 DECEMBER 1979

PHOTO 3

CREST OF DIKE AT FRAME DWELLING - LOOKING NORTH

PHOTO 4

CREST AND DOWNSTREAM FACE OF DIKE AT FRAME DWELLING - LOOKING SOUTH

CLINTON MILLS DIKE
28 DECEMBER 1979

28 DECEMBER 1979

PHOTO 5

RAILROAD TIE WALL ADJACENT TO OFFICE BUILDING

28 NOVEMBER 1979

PHOTO 6

CREST AND UPSTREAM FACE OF DIKE AT OFFICE BUILDING

CLINTON MILLS DIKE

PHOTO 7

CREST OF NORTH SECTION OF DIKE

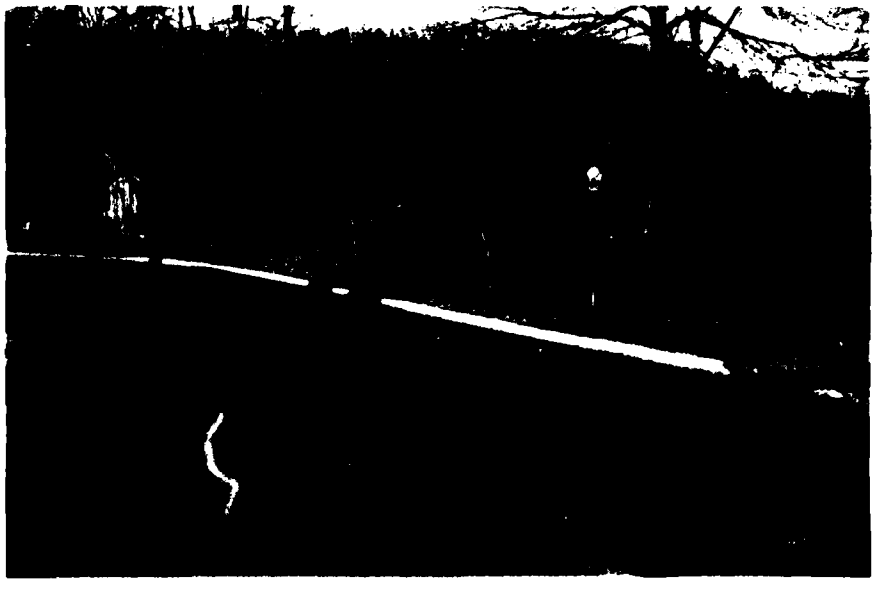


PHOTO 8

DOWNSTREAM FACE OF NORTH SECTION OF DIKE

CLINTON MILLS DIKE
28 DECEMBER 1979

PHOTO 9

CREST AND DOWNSTREAM FACE OF DIKE AT LOW POINT

PHOTO 10

DOWNSTREAM FLOOD PLAIN OF DIKE

CLINTON MILLS DIKE
28 DECEMBER 1979

APPENDIX 3

Engineering Data

CHECK LIST

HYDROLOGIC AND HYDRAULIC DATA

ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: Hilly and wooded with limited development

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 188.4 (21 acre-feet)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): N.A.

ELEVATION MAXIMUM DESIGN POOL: 200.4

ELEVATION TOP DAM: Varies: 191.8 to 193.2

SPILLWAY CREST: None (located at Clinton Mills Dam)

a. Elevation N.A.
b. Type N.A.
c. Width N.A.
d. Length N.A.
e. Location Spillover N.A.
f. Number and Type of Gates N.A.

OUTLET WORKS: None (located at Clinton Mills Dam)

a. Type N.A.
b. Location N.A.
c. Entrance inverts N.A.
d. Exit inverts N.A.
e. Emergency draindown facilities: N.A.

HYDROMETEOROLOGICAL GAGES: None

a. Type N.A.
b. Location N.A.
c. Records N.A.

MAXIMUM NON-DAMAGING DISCHARGE:

(Lake stage equal to top of dam) N.A.

APPENDIX 4

Hydraulic/Hydrologic Computations

STORCH ENGINEERS

Sheet 1 of 9

Project CLINTON MILLS DIKE Made By STO Date 1/2/80

Chkd By JG Date 1/15/80

HYDROLOGY

THE PEAK PMF INFLOW, Q_{PMF}, WILL BE DETERMINED BY ADJUSTING THE VALUE FOR Q_{PMF} FOR THE SOUTH BRANCH RARITAN RIVER AT STANTON, NEW JERSEY. (REF. RARITAN RIVER SURVEY REPORT, MARCH 1971, NEW YORK DISTRICT, CORPS OF ENGINEERS)

SOUTH BRANCH RARITAN RIVER AT CLINTON MILLS
DRAINAGE AREA, D.A. = 111 SQ. MI.

SOUTH BRANCH RARITAN RIVER AT STANTON
DRAINAGE AREA, D.A. = 147 SQ MI.

USING THE RELATIONSHIP, $\frac{Q_1}{Q_2} = \left(\frac{DA_1}{DA_2}\right)^{0.75}$, Q_{PMF} AT CLINTON MILLS IS COMPUTED AS FOLLOWS:

$$Q_{PMF} = \left(\frac{111}{147}\right)^{0.75} (146{,}000)$$

$$Q_{PMF} = 119{,}500 \text{ CFS}$$

$$Q_{\frac{1}{2}PMF} = 59{,}500 \text{ CFS}$$

INFLOW HYDROGRAPH

THE PMF HYDROGRAPH, DETERMINED BY ADJUSTING THE PMF HYDROGRAPH, SUPPLIED BY THE U.S. ARMY CORPS OF ENGINEERS, IS AS FOLLOWS:

DAY	HOUR	INFLOW (CFS)	DAY	HOUR	INFLOW (CFS)
0	1	4800	0	23	51800
	2	3200	1	0	42200
	3	3200		1	35600
	4	4800		2	30800
	5	4800		3	24100
	6	64000		4	17800
	7	82000		5	16200
	8	10400		6	13000
	9	14600		7	11400
	10	19400		8	10600
	11	32400		9	9800
	12	48600		10	9000
	13	71200		11	8200
	14	89200		12	7200
	15	107000		13	6400
	16	119000		14	5600
	17	107000		15	4800
	18	97200		16	4800
	19	89200		17	4800
	20	81000		18	4000
	21	71200		19	3200
	22	60000			

STORCH ENGINEERS

Sheet 3 of 9

Project CLINTON MILLS DIKE

Made By STO Date 1/2/80

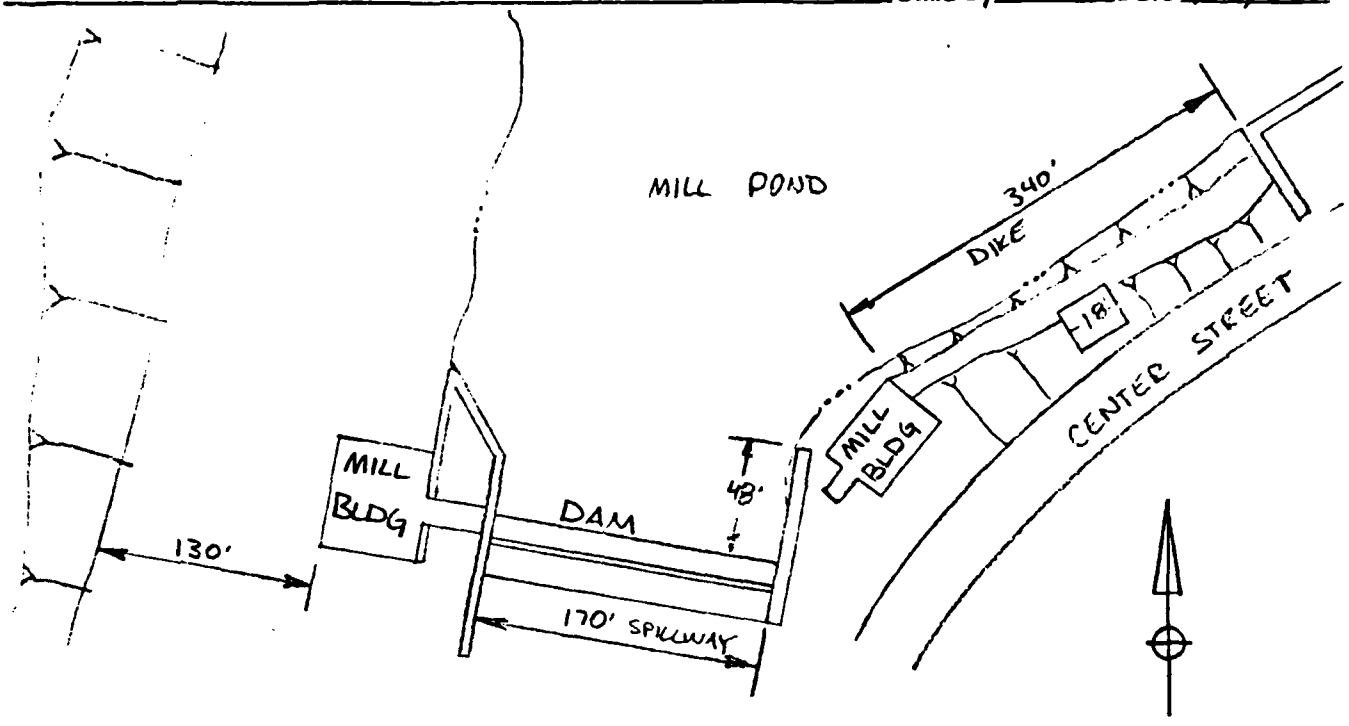
Chkd By JG Date 1/15/80

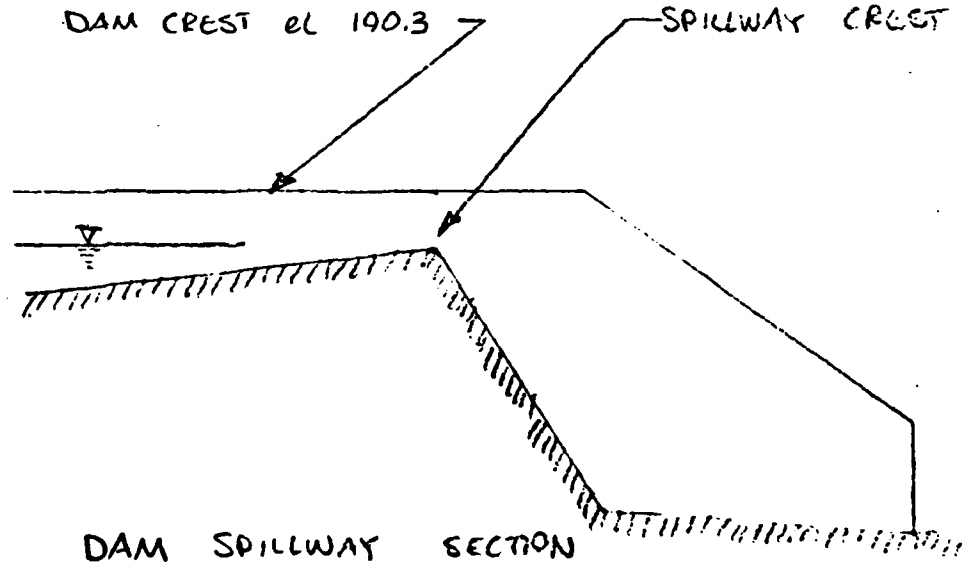
LAKE STORAGE VOLUME

ELEVATION	SURFACE AREA (ACRES)
182.0	0
188.4	10
200	144
220	329
240	562
260	820

HEC-1-DB PROGRAM WILL DEVELOP STORAGE CAPACITY FROM SURFACE AREAS & ELEVATIONS

INFORMATION FROM USGS. QUADRANGLE





DAM SPILLWAY SECTION

HYDRAULICS

STAGE DISCHARGE CALCULATION - DISCHARGE WILL BE CALCULATED BY THE FORMULA, $Q = CLH^{3/2}$; WHERE:

Q: DISCHARGE IN CFS
C: VARIABLE COEFFICIENT OF DISCHARGE
L: EFFECTIVE LENGTH OF CREST
H: TOTAL HEAD ON CREST

THE COEFFICIENTS OF DISCHARGE ARE TAKEN FROM "THE HANDBOOK OF HYDRAULICS" BY KING & BRATER

THE DISCHARGE CALCULATION FOR THE DIKE INCLUDES: OVERTOPPING OF THE SPILLWAY AT CLINTON MILLS DAM AT STAGE 188.0 & OVERTOPPING OF DAM CREST AT STAGE 190.3.

TAILWATER HAS BEEN DETERMINED TO HAVE NO EFFECT ON DISCHARGE UNTIL RIVER STAGE (TAILWATER) REACHES 190.0. THEREFORE; DISCHARGE COEFFICIENTS WILL NOT BE ADJUSTED FOR SUBMERGED CONDITIONS.

FOR THE PURPOSES OF COMPUTER INPUT, THE TOP OF DAM ELEVATION IS ASSUMED TO BE 191.8 (TOP OF DIKE), LENGTH = 452' (LENGTH OF DIKE = 322' PLUS 130' OF CREST LENGTH TO THE RIGHT (WEST) OF THE CLINTON MILLS DAM SPILLWAY), COEFFICIENT OF DISCHARGE FOR FLOW OVER TOP OF DIKE = 2.63

STAGE DISCHARGE CALCULATION (con't)

SPILLWAY

CREST ELEVATION = 188.
EFFECTIVE LENGTH = 170.
AVERAGE "C" = 3.3

DAM

CREST ELEVATION = 190.3
EFFECTIVE LENGTH = 48.
AVERAGE "C" = 2.63

WATER SURFACE ELEVATION	DISCHARGE OVER SPILLWAY Q_1 (cfs)	DISCHARGE OVER DIKE Q_2 (cfs)	TOTAL DISCHARGE $Q_T = Q_1 + Q_2$
188	0.	0	0.
189	561.	0	561.
190.3	1906	0	1906.
191.	2915	74.	2989
191.8	4156	232.	4388
192.	4488	280.	4768
193	6272	560.	6832
194.	8245	898.	9143
195.	10390	1286.	11676
196.	12694	1718.	14412
198.	17740	2697.	20437
200.	23320	3814.	27134
202.	29387	5052.	34439

STORCH ENGINEERS

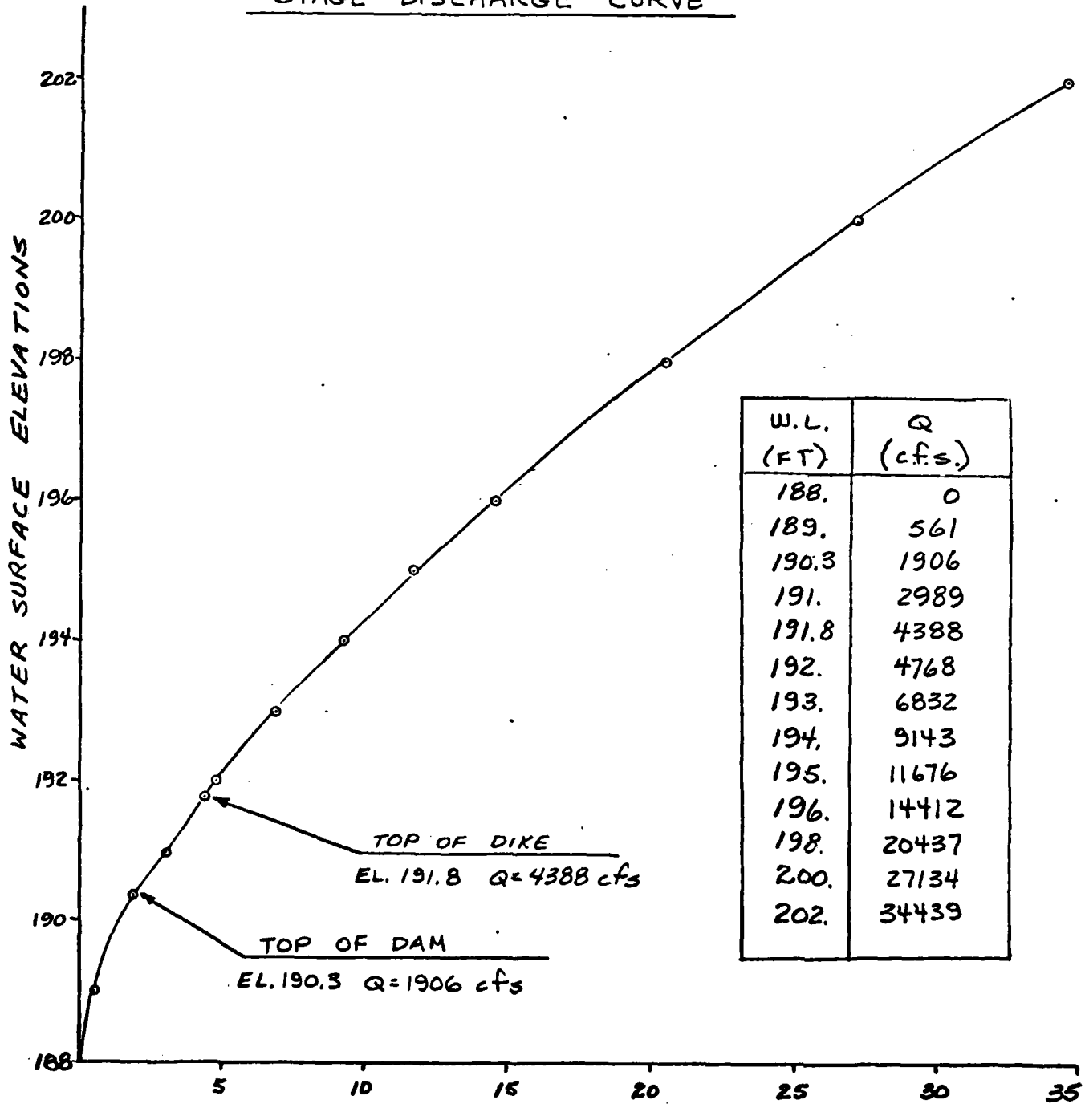
Project CLINTON MILLS DIKE

Sheet 7 of 9

Made By CLO Date 4/8/80

Chkd By JG Date 4/9/80

STAGE DISCHARGE CURVE



W.L. (FT)	Q (c.f.s.)
188.	0
189.	561
190.3	1906
191.	2989
191.8	4388
192.	4768
193.	6832
194.	9143
195.	11676
196.	14412
198.	20437
200.	27134
202.	34439

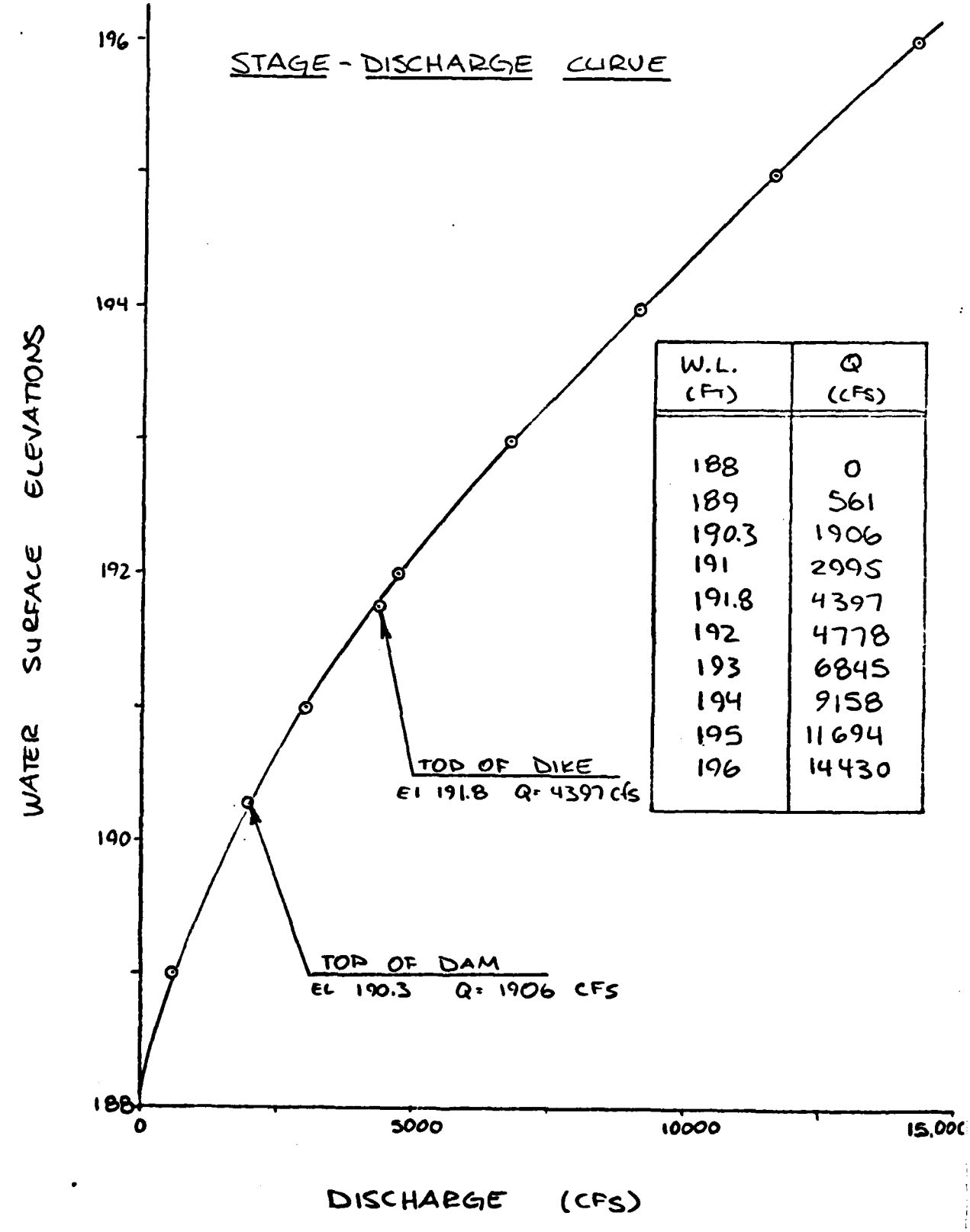
STORCH ENGINEERS

Sheet 8 of 9

Project CLINTON MILLS DIKE

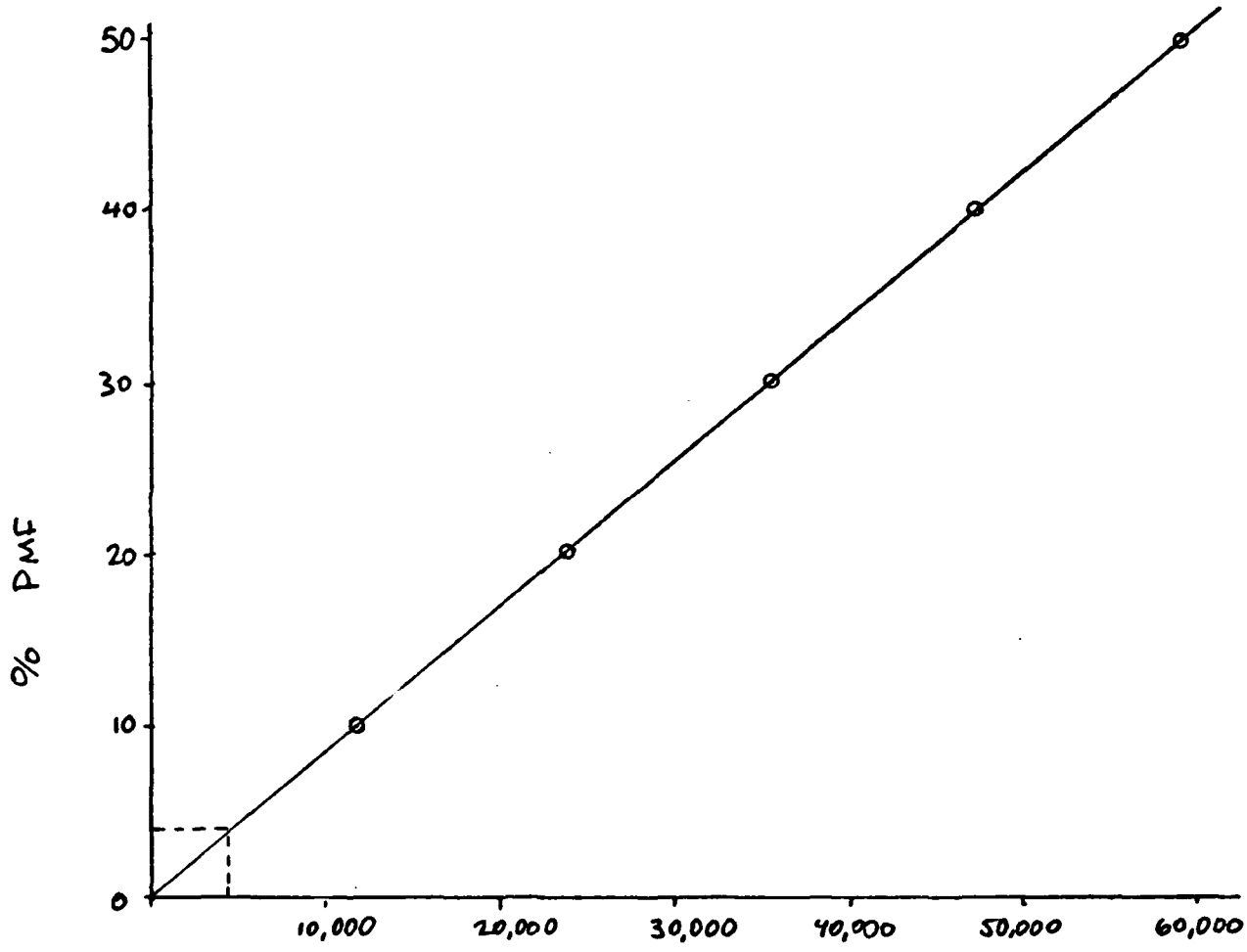
Made By STD Date 1/2/80

Chkd By JG Date 1/15/80



W.L. (Ft)	Q (CFS)
188	0
189	561
190.3	1906
191	2995
191.8	4397
192	4778
193	6845
194	9158
195	11694
196	14430

OVERTOPPING POTENTIAL



OVERTOPPING OF THE DIKE OCCURS AT ELEVATION 191.8 WITH Q = 4397 CFS ∴ DIKE CAN PASS APPROXIMATELY 7.4 % SDF OR 3.7 % PMF

HEC-1-DB COMPUTATIONS

```
A1                                  NATIONAL DAM SAFETY PROGRAM
A2                          CLINTON MILLS DIKE, CLINTON, NEW JERSEY
A3                                    MULTI RATIO PMF ROUTING
B      43         1         0                                                  3
B1      5
J       1                    5         1
J1    0.5       0.4       0.3       0.2       0.1
K       0      LAKE                                          1
K1                          INFLOW HYDROGRAPH TO CLINTON MILLS DIKE
M      -1                   111                 111         0                  1
N    4800      3200      3200      4800      4800      6400      8200     10400     14600     19400
N   32400     48600     71200     89200    107100    119000    107000     97200     89200     81000
N   71200     60000     51800     42200     35600     30800     24100     17800     16200     13000
N   11400     10600      9800      9000      8200      7200      6400      5600      4800      4800
N    4800      4000      3200
K       1      DIKE                                                  1
K1                                  ROUTE DISCHARGE THRU DIKE
Y                                     1         1
Y1      1                                                 -188.4        -1
Y4    188       189     190.3       191     191.8       192       193       194       195       196
Y4    198       200       202
Y5      0       561      1906      2989      4388      4768      6832      9143     11676     14412
Y5  20437     27134     34439
SA      0        10       144       329       562       820
SE    182     188.4       200       220       240       260
SS    188
SD  191.8      2.63       1.5       452
K      99
KA
A
A
A
A
```

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**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION      JULY 1978
  LAST MODIFICATION  26 FEB 79
**********

RUN  DATE= 80/04/08.
     TIME= 10.58.54.
```

NATIONAL DAM SAFETY PROGRAM
CLINTON MILLS DIKE, CLINTON, NEW JERSEY
MULTI RATIO PMF ROUTING

JOB SPECIFICATION

NO	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
43	1	0	0	0	0	0	0	3	0

JOPER	NWT	LROPT	TRACE
5	0	0	0

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 5 LRTIO= 1

RTIOS= .50 .40 .30 .20 .10

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

INFLOW HYDROGRAPH TO CLINTON MILLS DIKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	IAAME	ISTAGE	IAUTO
LAKE	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
-1	0	111.00	0.00	111.00	0.00	0.000	0	1	0

INPUT HYDROGRAPH

4800.	3200.	3200.	4800.	4800.	6400.	8200.	10400.	14600.	19400.
32400.	48600.	71200.	89200.	107100.	119000.	107000.	97200.	89200.	81000.
71200.	60000.	51800.	42200.	35600.	30800.	24100.	17800.	16200.	13000.
11400.	10600.	9800.	9000.	8200.	7200.	6400.	5600.	4800.	4800.
4800.	4000.	3200.							

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	119000.	100767.	52521.	31865.	1370200.
CMS	3370.	2853.	1487.	902.	38800.
INCHES		8.44	17.61	19.14	19.14
MM		214.50	447.19	486.11	486.11
AC-FT		49967.	104174.	113240.	113240.
THOUS CU M		61633.	128496.	139679.	139679.

HYDROGRAPH AT STA LAKE FOR PLAN 1, RTIO 1

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	59500.	50383.	26260.	15933.	685100.
CMS	1685.	1427.	744.	451.	19400.
INCHES		4.22	8.80	9.57	9.57
MM		107.25	223.60	243.06	243.06
AC-FT		24983.	52087.	56620.	56620.
THOUS CU M		30817.	64248.	69840.	69840.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE DISCHARGE THRU DIKE

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
DIKE	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-188.	-1

STAGE	188.00	189.00	190.30	191.00	191.80	192.00	193.00	194.00	195.00	196.00
	198.00	200.00	202.00							
FLOW	0.00	561.00	1906.00	2989.00	4388.00	4768.00	6832.00	9143.00	11676.00	14412.00
	28437.00	27134.00	34439.00							
SURFACE AREA=	0.	10.	144.	329.	562.	820.				
CAPACITY=	0.	21.	764.	5368.	14175.	27914.				
ELEVATION=	182.	188.	200.	220.	240.	260.				

CREL	SPWID	COQW	EXPW	ELEVL	COOL	CAREA	EXPL
188.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
191.8	2.6	1.5	452.

STATION DIKE, PLAN 1, RATIO 1

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

3338.	1420.	1670.	2138.	2522.	2921.	3964.	4959.	6985.	9387.
15034.	23178.	33519.	43289.	51681.	58592.	55602.	49095.	45474.	41176.
36540.	30928.	26379.	21937.	18058.	15773.	12535.	9267.	8047.	6868.
5659.	5410.	4928.	4582.	4181.	3717.	3263.	2883.	2476.	2365.
2416.	2098.	1677.							

STORAGE

72.	41.	46.	54.	59.	66.	83.	99.	122.	148.
269.	303.	436.	576.	707.	822.	773.	665.	609.	545.
478.	401.	343.	288.	243.	217.	181.	146.	133.	120.
107.	104.	98.	94.	87.	79.	71.	65.	59.	57.
58.	53.	46.							

STAGE

191.2	189.8	190.1	190.5	190.7	191.0	191.6	192.0	192.6	193.2
194.4	195.8	197.3	198.6	199.6	200.4	200.1	199.3	198.8	198.3
197.7	196.9	196.3	195.6	194.9	194.5	193.9	193.2	192.9	192.6
192.3	192.2	192.0	191.9	191.7	191.4	191.2	190.9	190.7	190.6
190.6	190.4	190.1							

PEAK OUTFLOW IS 58592. AT TIME 16.00 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	58592.	50446.	26258.	15940.	685422.
CMS	1659.	1428.	744.	451.	19409.
INCHES		4.23	8.80	9.57	9.57
MM		107.38	223.57	243.17	243.17
AC-FT		25015.	52081.	56646.	56646.
THOUS CU M		30855.	64242.	69872.	69872.

SUMMARY OF DAM SAFETY ANALYSIS

.....		INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
	ELEVATION	186.40	188.00	191.80
	STORAGE	21.	18.	91.
	OUTFLOW	224.	0.	4388.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.50	200.40	8.60	822.	58592.	27.00	16.00	0.00
.40	199.03	7.23	632.	46977.	23.00	16.00	0.00
.30	197.52	5.72	460.	35289.	20.00	16.00	0.00
.20	195.83	4.03	308.	23587.	17.00	16.00	0.00
.10	193.75	1.95	173.	11799.	13.00	16.00	0.00

APPENDIX 5

Bibliography

1. "Recommended Guidelines for Safety Inspection of Dams," Department of the Army, Office of the Chief of Engineers, Washington, D.C. 20314.

2. Design of Small Dams, Second Edition, United States Department of the Interior, Bureau of Reclamation, United States Government Printing Office, Washington, D.C., 1973.

3. Holman, William W. and Jumikis, Alfreds R., Engineering Soil Survey of New Jersey, Report No. 6, Hunterdon County, Rutgers University, New Brunswick, N.J., 1953.

4. "Geologic Map of New Jersey," prepared by J. Volney Lewis and Henry B. Kummel, dated 1910 - 1912.

5. Herr, Lester A., Hydraulic Charts for the Selection of Highway Culverts, U.S. Department of Transportation, Federal Highway Administration, 1965.

6. Safety of Small Dams, Proceedings of the Engineering Foundation Conference, American Society of Civil Engineers, 1974.

7. King, Horace Williams and Brater, Ernest F., Handbook of Hydraulics, Fifth Edition, McGraw-Hill Book Company, 1963.

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